

MAGIC Observation of the Galactic Center

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for the MAGIC collaboration

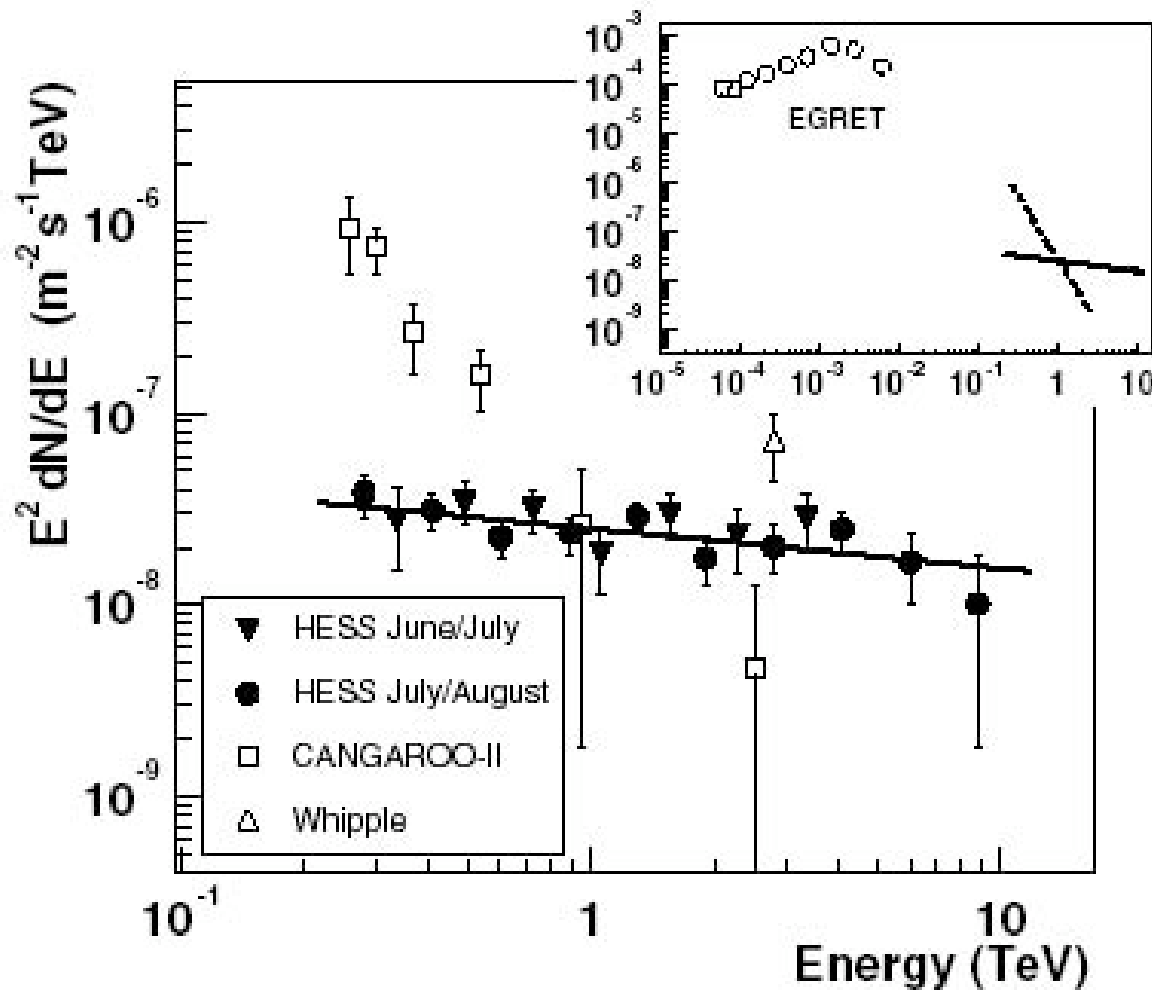
(most of the material taken from H. Bartko et al. for MAGIC, ICRC2005)

Outline

- introduction
- observations under large zenith angle
- source location
- first spectrum

GC observed in VHE gamma by Cangaroo, HESS, Whipple

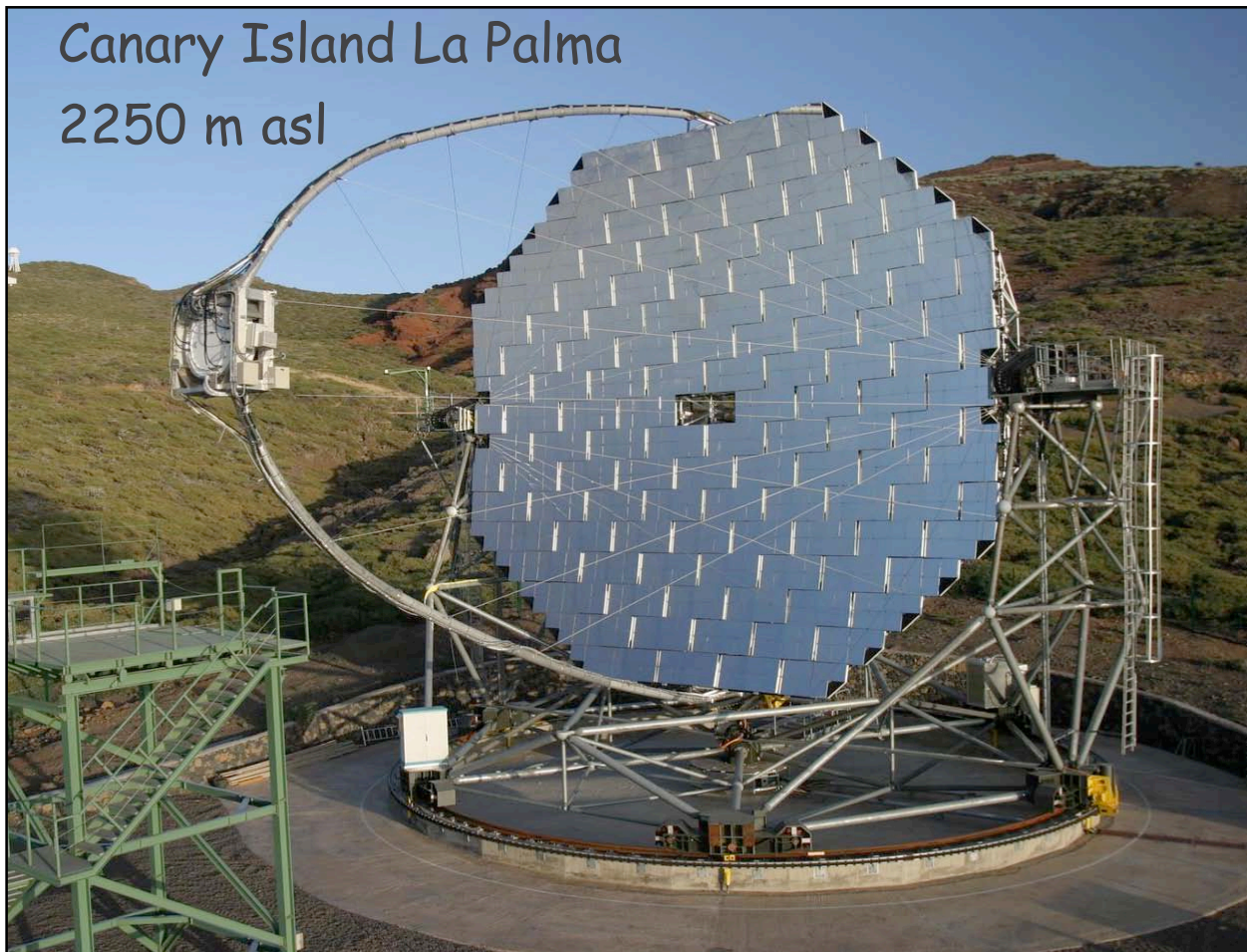
- HESS and Cangaroo results don't match



Cangaroo spectral index
 $\gamma = -4.6 \pm 0.5$

HESS spectral index
 $\gamma = -2.63 \pm 0.04$

The MAGIC Telescope



Largest Imaging Air Cherenkov Telescope

for γ -ray astronomy:

- 17 m \odot mirror dish
- 3.5° field of view
- enhanced QE PMTs

design aimed for:

- low energy threshold
 $E_\gamma > 30 \text{ GeV}$
- fast repositioning
 $t_R < 30 \text{ s}$

In final configuration since September 2004 [NIM A518 (2004) 188]

Observations

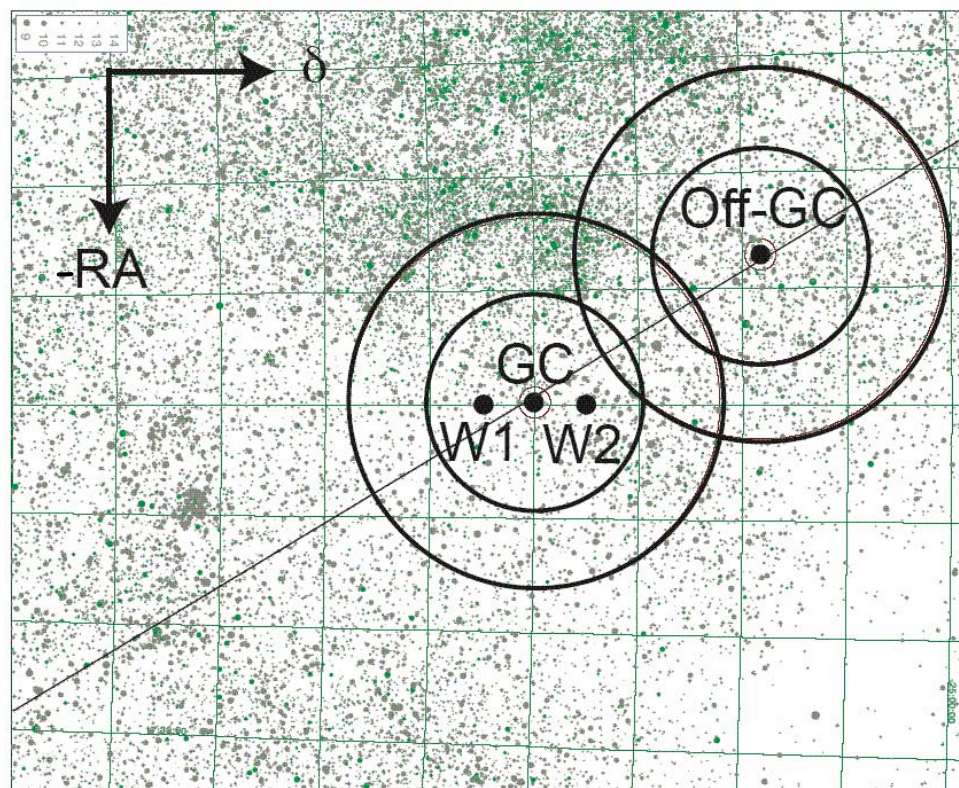
GC: culminates at $\sim 58^\circ$ **deg ZA** in La Palma

few very bright stars, but inhomogeneous star field

-> **dedicated OFF** observations or **wobble** mode observations

MAGIC data:

- initial observ. in Sept. 2004,
 ~ 2.5 h only ON data,
 $60^\circ \leq \text{ZA} \leq 70^\circ$
not included in this analysis
- May 2005: ~ 7 h wobble data,
 $58^\circ \leq \text{ZA} \leq 62^\circ$
- June/July 2005, ~ 15 h ON,
 ~ 12 h OFF data,
 $58^\circ \leq \text{ZA} \leq 62^\circ$



Analysis Chain

data + MC:

calibration

absolute image cleaning: 10/5 photo electrons threshold

calculation of Hillas image parameters

Random Forest algorithm for gamma/hadron separation,

energy estimation [NIM A516 (2004) 511]

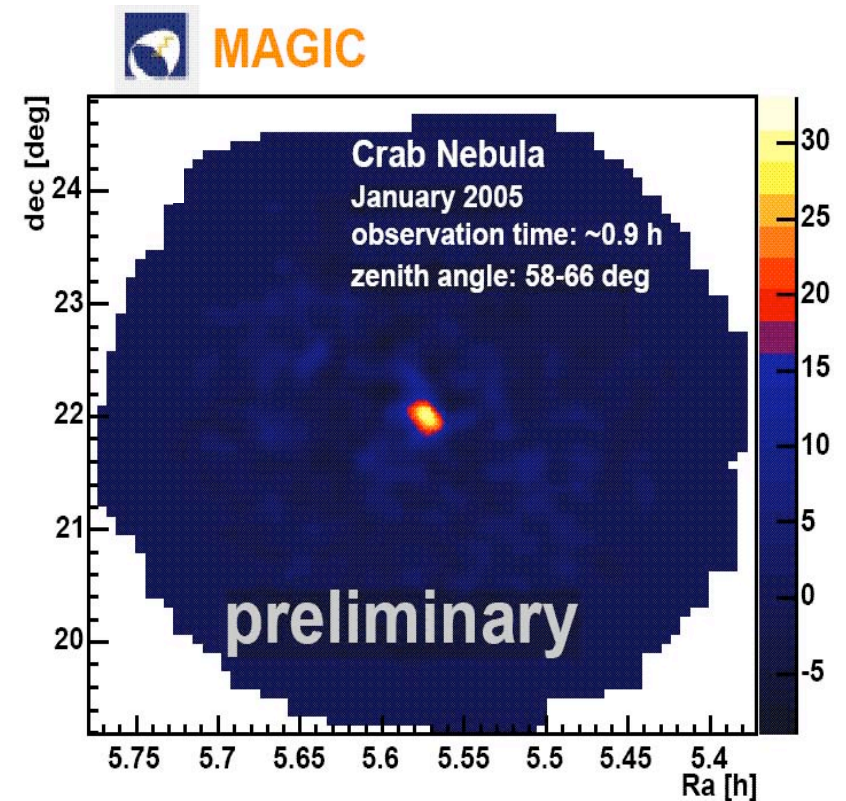
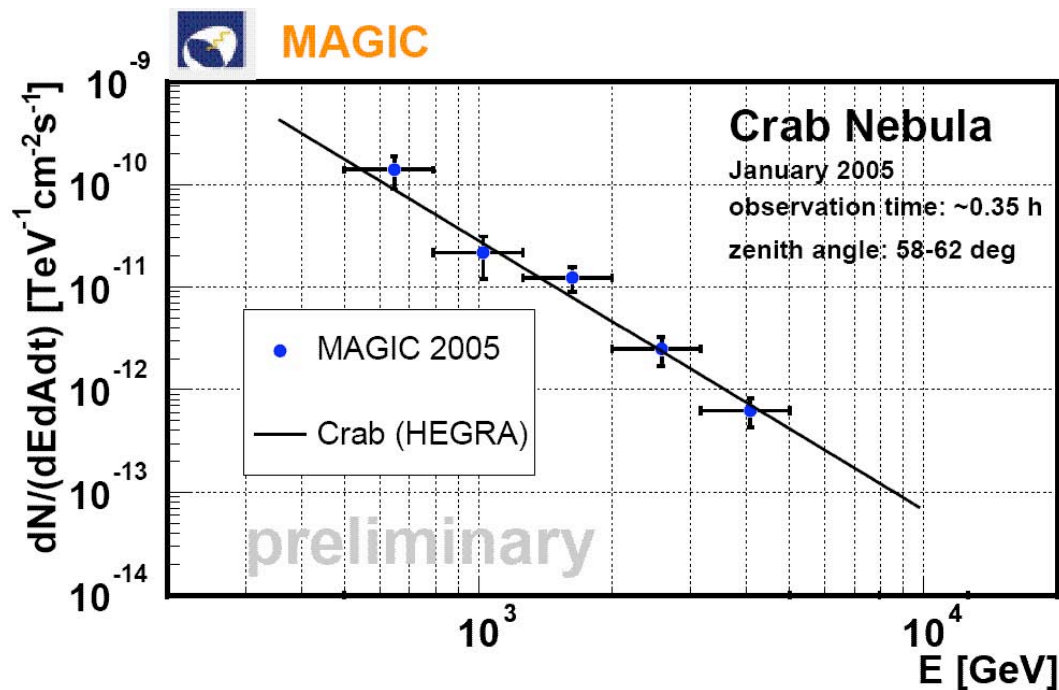
RF training: MC gamma - GC OFF data

-> gamma signal (ALPHA, DISP analysis)

-> sky-maps, spectra

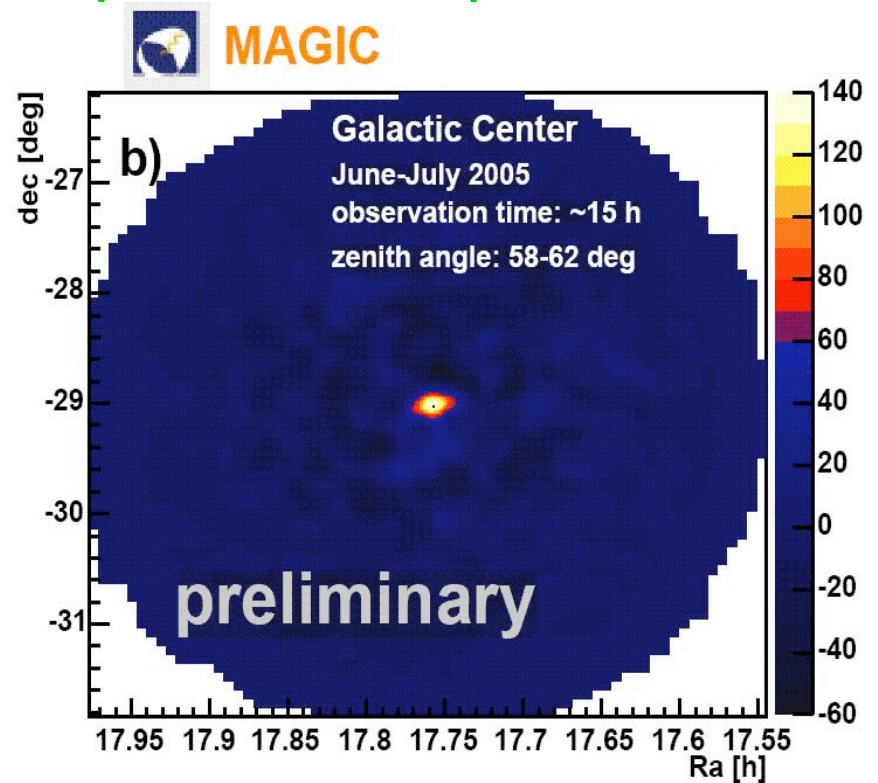
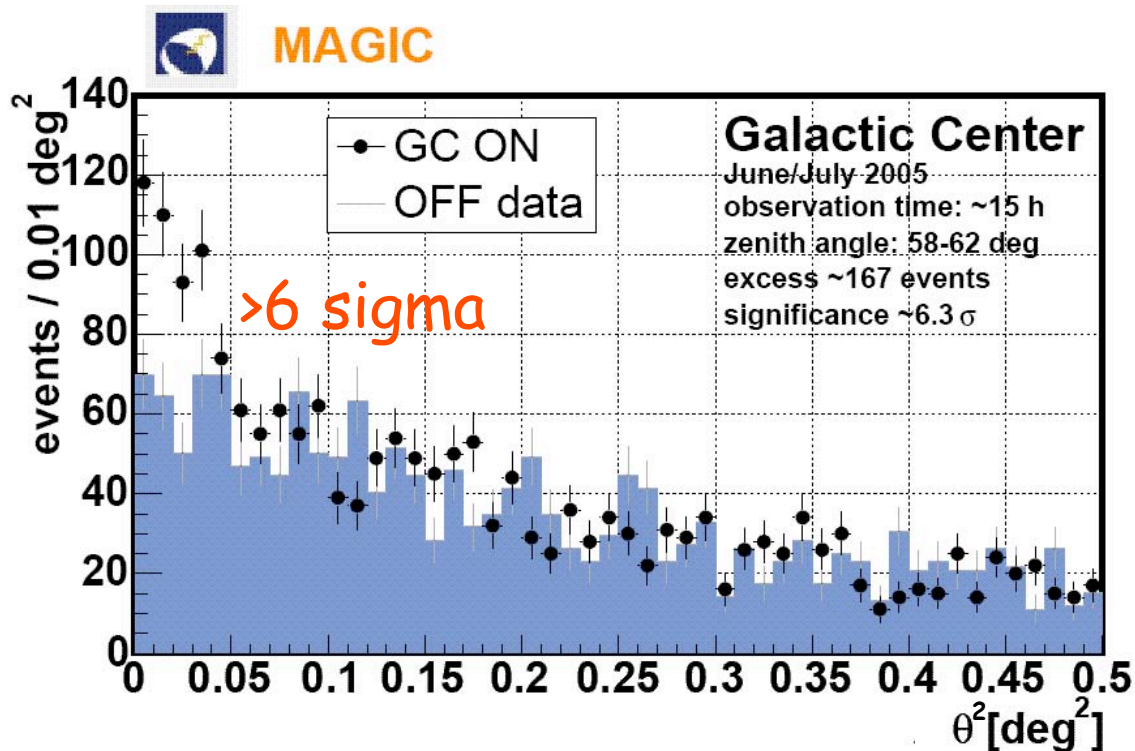
Test: Crab at Large Zenith Angle

- to **test** the analysis chain at **large ZA**: analyzed Crab data
- due to large ZA ($\sim 60^\circ$): higher threshold (~ 700 GeV), but also larger effective collection area \rightarrow **good sensitivity**
- **flux**: **consistent** with previous measurements (HEGRA)



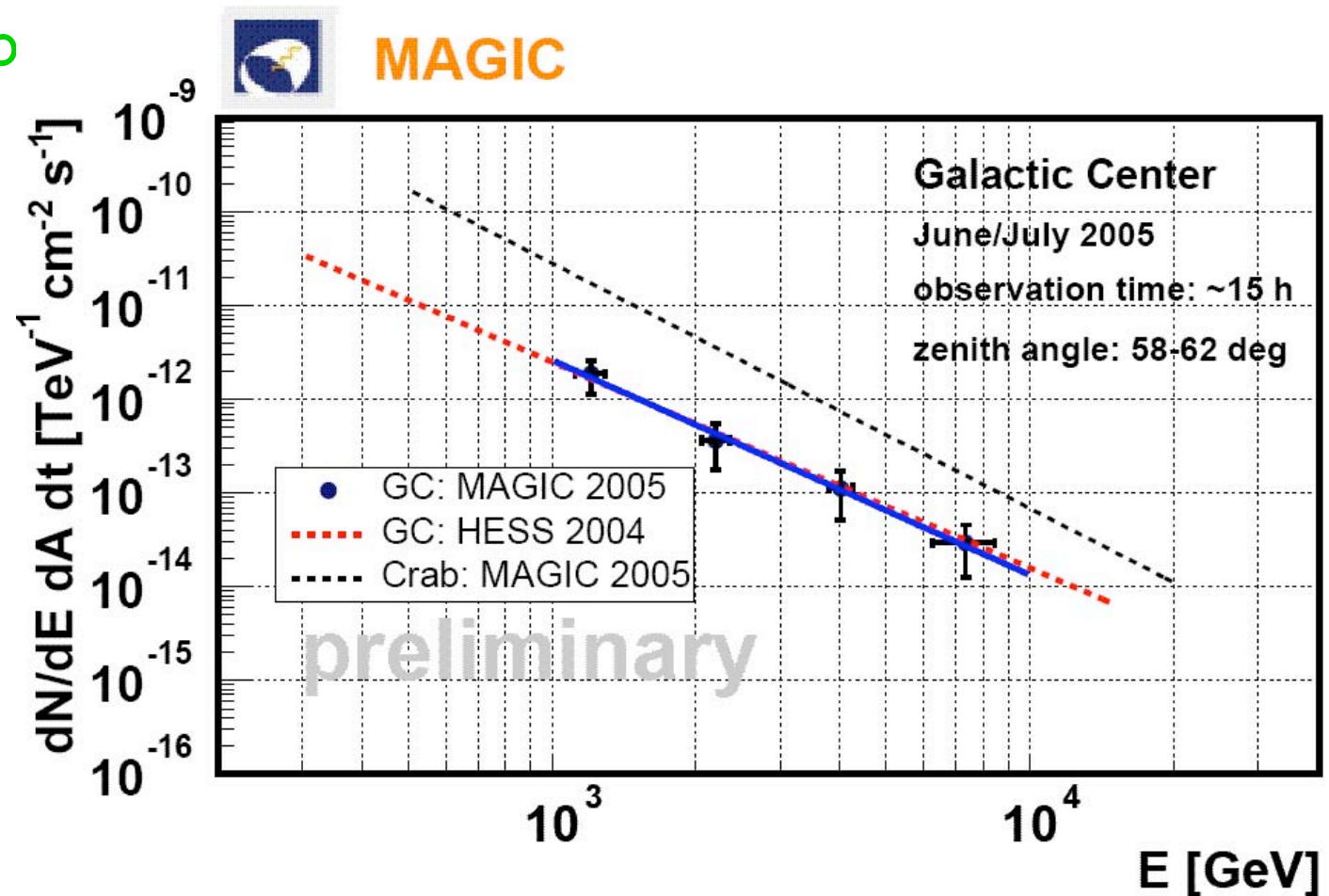
GC: Sky Maps

- GC ON/OFF data: 15h/8h, June+July 2005, more data on tape
- excess location: (Ra,Dec)=(17^h45'20", -29°2'), $\pm 0.05^\circ$ sys. error
- Galactic Center: within resolution compatible with point source



GC: Preliminary Spectrum

- rather **hard spectrum**, $\Gamma = -2.3 \pm 0.4$
- flux: **$\sim 10\%$ of Crab**
above **1 TeV**
- **no apparent variability** during
2 month of
observations
- compatible with
HESS measurements, not w/
Cangaroo



Conclusions

- Galactic Center has been observed by MAGIC under large ZA
- excess compatible with point-like source
- no apparent variability during 2 month of observations in 2005
- relatively hard spectrum, about 0.1 Crab above 1 TeV, compatible with HESS results
- possible source for inter-calibration of different IACTs